

Appl. No.: 09/710,442
Amdt. Dated January 7, 2004
Response to Office Action of October 20, 2004

Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (currently amended) A method comprising:

monitoring performance of a network application at a demarcation point in a network by generating collecting, at the demarcation point, data indicative of a first network latency condition between a first TCP host on a first side and the demarcation point and a second network latency condition between a second TCP host on a second side and the demarcation point; and

determining, based on analysis of the data indicative of the first and second network latency conditions, a location of a performance problem associated with the network application identified as a result of monitoring performance, the location being with respect to the demarcation point.
2. (Previously presented) The method defined in Claim 1 further comprising mediating between infrastructure of the network managed by the source provider and customer-managed infrastructure of the network.
3. (Previously presented) The method defined in Claim 1 further comprising mediating between a local area network (LAN) infrastructure of the network and wide area network (WAN) infrastructure of the network.
4. (Previously presented) The method defined in Claim 1 wherein monitoring performance of the network application comprises measuring end-to-end performance of the

Appl. No.: 09/710,442
Amdt. Dated January 7, 2004
Response to Office Action of October 20, 2004

network application with respect to the network.

5. (Previously presented) The method defined in Claim 1 wherein monitoring performance of the network application comprises measuring at least one of quantitative and qualitative performance of the network application.

6. (Currently amended) The method defined in Claim 1, wherein the demarcation point is located between a customer network and a provider network, and wherein monitoring performance of the network application comprises measuring congestion on a the customer network and a the provider network at the demarcation point between the customer network and the provider network.

7. (Previously presented) The method defined in Claim 6 wherein measuring congestion includes identifying a class of traffic being affected.

8. (Previously presented) The method defined in Claim 1 wherein monitoring performance comprises measuring network availability.

9. (Previously presented) The method defined in Claim 1 wherein the performance problem comprises discarding packets.

10. (Previously presented) The method defined in Claim 1 wherein the performance

Appl. No.: 09/710,442
Amdt. Dated January 7, 2004
Response to Office Action of October 20, 2004

problem comprises retransmission that slows overall response time.

11. (currently amended) The method defined in Claim 1, wherein the first and second network latency conditions are expressed as congestion index values, the method further comprising: comparing congestion index values over time.

12. (Previously presented) The method defined in Claim 11 further comprising identifying the problem based on a ratio of the congestion index on a provider-controlled portion of the network versus the congestion index on a customer-controlled portion of the network being different.

13. (Previously presented) The method defined in Claim 11 further comprising identifying the problem based on a change in a ratio of the congestion index on a provider-controlled portion of the network versus the congestion index on a customer-controlled portion of the network being different.

14. (Previously presented) The method defined in Claim 11 further comprising identifying the problem based on a same amount of change occurring in the congestion index values on a provider-controlled portion of the network and a customer-controlled portion of the network.

15. (Previously presented) The method defined in Claim 1 further comprising:
measuring congestion index values; and

Appl. No.: 09/710,442
Amdt. Dated January 7, 2004
Response to Office Action of October 20, 2004

detecting variances in the congestion index values over time for a network time period; and
identifying the problem based on detected variances in the congestion index.

16. (Previously presented) The method defined in Claim 1 further comprising:
measuring congestion index values;
detecting variances in the congestion index over time between different types of traffic; and
identifying the problem based on detected variances in the congestion index.

17. (Previously presented) The method defined in Claim 1 further comprising:
comparing measurement values over time.

18. (Previously presented) The method defined in Claim 17 further comprising
identifying a problem based on a ratio of a measurement value on a provider-controlled portion of
the network versus a measurement value on a customer-controlled portion of the network being
different.

19. (Previously presented) The method defined in Claim 17 further comprising
identifying a problem based on a change in a ratio of a measurement value on a provider-controlled
portion of the network versus a measurement value on a customer-controlled portion of the
network being different.

20. (Previously presented) The method defined in Claim 17 further comprising

Appl. No.: 09/710,442
Amdt. Dated January 7, 2004
Response to Office Action of October 20, 2004

identifying a problem based on change in measurement values on a provider-controlled portion of the network and a customer-controlled portion of the network, where the change is by the same amount.

21. (Previously presented) The method defined in Claim 1 further comprising:

generating measurement values; and

detecting variances in the measurement values over time for a network time period.

22. (Previously presented) The method defined in Claim 1 further comprising:

generating measurement values; and

detecting variances in the measurement values over time for different types of traffic.

23. (Previously presented) The method defined in Claim 1 wherein monitoring

performance of the network application comprises characterizing performance of the network application using one or more metrics.

24. (Previously presented) The method defined in Claim 23 wherein the one or more

metrics comprises a delay metric characterizing delay associated with end-to-end traffic in the network.

25. (Previously presented) The method defined in Claim 23 wherein the one or more

metrics comprises a server delay metric characterizing delay of a server in responding to a request

Appl. No.: 09/710,442
Amdt. Dated January 7, 2004
Response to Office Action of October 20, 2004

associated with the network application.

26. (Previously presented) The method defined in Claim 23 wherein the one or more metrics comprises packet counts and data rates.

27. (Previously presented) The method defined in Claim 23 wherein the one or more metrics comprises frame relay counts.

28. (Previously presented) The method defined in Claim 1 further comprising:
monitoring customer network delay; and
monitoring provider network delay.

29. (Previously presented) The method defined in Claim 28 wherein a network device at the demarcation point monitors the customer network delay and the provider network delay as half round trip delays.

30. (Previously presented) The method defined in Claim 28 wherein the network device monitors inbound and outbound customer network delays associated with operation of the network application, inbound and outbound provider network delays associated with operation of the network application, and host latency associated with operation of the network application, and combines results of monitoring to create an indication of the delay associated with using the network application in the network.

Appl. No.: 09/710,442

Amdt. Dated January 7, 2004

Response to Office Action of October 20, 2004

31. (Currently Amended) A method comprising:
providing a demarcation point with respect to a network application provided by a provider
in a network; and

employing at least one service-level agreement between the provider of the network
application and a customer with responsibility for management of performance problems
associated with the network application based on the demarcation point; and

monitoring performance of the network application at the demarcation point in a network
by generating, at the demarcation point, data indicative of a first network latency condition
between a first TCP host on a first side and the demarcation point and a second network latency
condition between a second TCP host on a second side and the demarcation point.

32. (Previously presented) The method defined in Claim 31 further comprising:
monitoring compliance with the at least one service-level agreement; and
sending a notification if the service-level agreement is in one condition of a group consisting
of the service-level agreement is being violated or the service-level agreement is within a threshold
of being violated.

33. (Currently amended) A method comprising:
a network device ~~generating~~ collecting data related to operation of a network application at
a demarcation point in a network on behalf of a provider, wherein the data is indicative of a first
delay between a first TCP host on a first side and the demarcation point and a second delay

Appl. No.: 09/710,442
Amdt. Dated January 7, 2004
Response to Office Action of October 20, 2004

between a second TCP host on a second side and the demarcation point; and

the provider using the data generated ~~collected~~ at the demarcation point to determine whether a problem associated with the operation of the network application is a responsibility of the provider.

34. (Currently amended) The method defined in Claim 33 wherein the provider uses data generated ~~collected~~ at the demarcation point to correct an identified problem in the network.

35. (Currently amended) The method defined in Claim 33 wherein the provider uses data generated ~~collected~~ at the demarcation point to indicate to a user a need for an additional resource.

36. (Previously presented) The method defined in Claim 35 wherein the additional resource comprises additional bandwidth.

37. (Previously presented) The method defined in Claim 35 wherein the additional resource comprises additional server capacity.

38. (Currently amended) The method defined in Claim 33 wherein the provider uses data generated ~~collected~~ at the demarcation point to identify a service to offer to a customer.

39. (Currently amended) A network device for use at a demarcation point in a network,

Appl. No.: 09/710,442
Amdt. Dated January 7, 2004
Response to Office Action of October 20, 2004

the network device comprising:

a measurement engine to take measurements at the demarcation point and record information indicative of delays occurring in the network, wherein the delays correspond to a first delay between a first TCP host on a first side and the demarcation point and a second delay between a second TCP host on a second side and the demarcation point, the measurement engine to generate a measurement value in response to the information regarding delays;

a memory coupled to the measurement ~~management~~ engine to store the information indicative of the delays occurring in the network, including the measurement value; and

management control coupled to the memory to access the information indicative of the delays occurring in the network and to determine if a problem exists in the network that is a responsibility of a service provider.

40. (Previously presented) The network device defined in Claim 39 wherein the measurement engine performs measurements with respect to at least one of a group that includes network delays, server delays, bits per second, lost packets, retransmission counts, end-to-end delays.

41. (Previously presented) The network device defined in Claim 39 wherein the management control notifies the service provider about the problem.

42. (Previously presented) The network device defined in Claim 39 wherein the measurement engine records times associated with encountering packets and acknowledgement of

Appl. No.: 09/710,442
Amdt. Dated January 7, 2004
Response to Office Action of October 20, 2004

the packets to generate a measurement value.

43. (Currently Amended) The network device defined in Claim 39 wherein the measurement engine monitors performance of the a network application by ~~comprises~~ measuring end-to-end performance of the network application with respect to the network.

44. (Currently Amended) The network device defined in Claim 39 wherein the measurement engine monitors performance of the a network application by ~~comprises~~ measuring quantitative performance of the network application.

45. (Currently Amended) The network device defined in Claim 39 wherein the measurement engine monitors performance of the a network application by ~~comprises~~ measuring congestion.

46. (Previously presented) The network device defined in Claim 45 wherein the measurement engine measures congestion includes identifying a class of traffic being affected in order to solve a customer problem or provide a service to a customer to address the problem.

47. (Currently Amended) The network device defined in Claim 39 wherein the measurement engine monitors performance by ~~comprises~~ measuring network availability.

48. (Previously presented) The network device defined in Claim 39 wherein the

Appl. No.: 09/710,442
Amdt. Dated January 7, 2004
Response to Office Action of October 20, 2004

performance problem comprises discarding packets.

49. (Previously presented) The network device defined in Claim 39 wherein the performance problem comprises retransmission that slows overall response time.

50. (Previously presented) The network device defined in Claim 39 wherein the management control compares congestion index values over time.

51. (Currently Amended) The network device defined in Claim 50 wherein the management control identifies the problem based on a ratio of the congestion index on a provider-controlled portion of the network versus the congestion index on a customer-controlled portion of the network ~~being different~~.

52. (Currently Amended) The network device defined in Claim 50 wherein the management control identifies the problem based on a change in a ratio of the congestion index on a provider-controlled portion of the network versus the congestion index on a customer-controlled portion of the network ~~being different~~.

53. (Previously presented) The network device defined in Claim 50 wherein the management control identifies the problem based on a same amount of change occurring in the congestion index values on a provider-controlled portion of the network and a customer-controlled portion of the network.

Appl. No.: 09/710,442
Amdt. Dated January 7, 2004
Response to Office Action of October 20, 2004

54. (Currently Amended) The network device defined in Claim 38 39 wherein the measurement engine ~~measures~~ generates congestion index values, and the management control detects variances in the congestion index values over time for a network time period and identifies the problem based on detected variances in the congestion index.

55. (Currently Amended) The network device defined in Claim 38 39 wherein the measurement engine ~~measures~~ generates congestion index values, and the management control detects variances in the congestion index over time between different types of traffic and identifies the problem based on detected variances in the congestion index.

56. (Currently Amended) The network device defined in Claim 38 39 wherein the management control compares measurement values over time.

57. (Currently Amended) The network device defined in Claim 56 wherein the management control identifies a problem based on a ratio of a measurement value on a provider-controlled portion of the network versus a measurement value on a customer-controlled portion of the network ~~being different~~.

58. (Currently Amended) The network device defined in Claim 56 wherein the management control identifies a problem based on a change in a ratio of a measurement value on a provider-controlled portion of the network versus a measurement value on a customer-controlled portion of the network ~~being different~~.

Appl. No.: 09/710,442
Amdt. Dated January 7, 2004
Response to Office Action of October 20, 2004

59. (Previously presented) The network device defined in Claim 56 wherein the management control identifies a problem based on change in measurement values on a provider-controlled portion of the network and a customer-controlled portion of the network, where the change is by the same amount.

60. (Currently Amended) The network device defined in Claim ~~38~~ 39 wherein the measurement engine generates measurement values, and the management control detects variances in the measurement values over time ~~for a network time period~~.

61. (Currently Amended) The network device defined in Claim ~~38~~ 39 wherein the measurement engine generates measurement values, and the management control detects variances in the measurement values over time for different types of traffic.

62. (Currently Amended) The network device defined in Claim ~~38~~ 39 wherein the measurement engine characterizes performance of ~~the~~ a network application using one or more metrics.

63. (Previously presented) The network device defined in Claim 62 wherein the one or more metrics comprises a delay metric characterizing delay associated with end-to-end traffic in the network.

64. (Previously presented) The network device defined in Claim 62 wherein the one or

Appl. No.: 09/710,442
Amdt. Dated January 7, 2004
Response to Office Action of October 20, 2004

more metrics comprises a server delay metric characterizing delay of a server in responding to a request associated with the network application.

65. (Previously presented) The network device defined in Claim 62 wherein the one or more metrics comprises packet counts and data rates.

66. (Previously presented) The network device defined in Claim 62 wherein the one or more metrics comprises frame relay counts.

67. (Currently Amended) The network device defined in Claim ~~38~~ 39 wherein the measurement engine monitors customer network delay and provider network delay.

68. (Previously presented) The network device defined in Claim 67 wherein the measurement engine monitors the customer network delay and the provider network delay as half round trip delays.

69. (Currently Amended) The network device defined in Claim ~~38~~ 39 wherein the measurement monitors inbound and outbound customer network delays associated with operation of ~~the a~~ network application, inbound and outbound provider network delays associated with the operation of the network application, and host latency associated with the operation of the network application, and wherein the management control combines results of monitoring to create an indication of the delay associated with using the network application in the network.

Appl. No.: 09/710,442

Amdt. Dated January 7, 2004

Response to Office Action of October 20, 2004

70. (Currently Amended) The network device defined in Claim 38 39 further comprising

a classification engine to classify traffic in a traffic flow on the network;
a response time block to monitor response time; and
a shaping block to shape traffic, wherein the measurement engine is communicatively coupled to the classification engine, the response time block, and the shaping block to obtain information to create measurements.

71. (Currently amended) An architecture comprising:

a network device for use in a network at a demarcation point, the network device comprising
a measurement engine to take measurements at the demarcation point and record information indicative of delays occurring in the network, wherein the delays correspond to a first delay between a first TCP host on a first side and the demarcation point and a second delay between a second TCP host on a second side and the demarcation point, the measurement engine to generate a measurement value in response to the information regarding delays,

a memory coupled to the measurement ~~management~~ engine to store the information indicative of the delays occurring in the network, including the measurement value, and

management control coupled to the memory to access the information indicative of the delays occurring in the network and to determine if a problem exists in the network that is the responsibility of an application service provider;

a service provider communicatively coupled to the network device via the network, wherein

Appl. No.: 09/710,442
Amdt. Dated January 7, 2004
Response to Office Action of October 20, 2004

the service provider and management control of the network device communicate between each other regarding a problem associated with operation of the network application.

72. (Previously presented) The network architecture defined in Claim 71 wherein the management control notifies the service provider that the problem exists and the service provider sends an event to address the problem.

73. (Previously presented) The network architecture defined in Claim 72 wherein the service provider sends an event to fix the problem.

74. (Previously presented) The network architecture defined in Claim 72 wherein the service provider sends an event to alleviate the problem.

75. (Previously presented) The network architecture defined in Claim 74 wherein the network device shapes traffic in response to the event.

76. (Previously presented) The network architecture defined in Claim 75 wherein the network device shapes traffic by controlling non-essential traffic.

77. (Previously presented) The network architecture defined in Claim 71 wherein the network device further comprises:

a classification engine to classify traffic in a traffic flow on the network;

Appl. No.: 09/710,442

Amdt. Dated January 7, 2004

Response to Office Action of October 20, 2004

a response time block to monitor response time; and
a shaping block to shape traffic, wherein the measurement engine is communicatively coupled to the classification engine, response time block, and the shaping block to obtain information to create measurements by which to identify the problem with the operation of the a network application.

78. (Previously presented) The network architecture defined in Claim 71 wherein the service provider sends an event to the network device for notification of the problem.

79. (Previously presented) The network architecture defined in Claim 71 wherein the service provider allocates additional bandwidth in response to notification of the problem.

80. (Previously presented) The network architecture defined in Claim 71 wherein the network device records times associated with encountering packets and acknowledgement of the packets to generate a measurement value.

81. (Previously presented) The network architecture defined in Claim 71 wherein the network device records the sequence number of each of a plurality of packets and a time each of the plurality of packets reached the application layer demarcation point.

82. (Previously presented) The network architecture defined in Claim 71 wherein the measurement engine performs measurements based on whether a sequence number associated with

Appl. No.: 09/710,442
Amdt. Dated January 7, 2004
Response to Office Action of October 20, 2004

an acknowledgement is equal to a sequence number of one of the previously recorded packets and the acknowledgement is a naked acknowledgement, and wherein the management control calculates a difference between the time the acknowledgement is at the demarcation point and the time that the data packet is originally seen at the demarcation point.

83. (Previously presented) The network architecture defined in Claim 71 further comprising a customer data center coupled to a network device.

84. (Previously presented) The network architecture defined in Claim 83 wherein the customer data center is coupled to a network device via a local area network.

85. (Currently Amended) The method defined in Claim 1 wherein the first and second network latency conditions characterize network transmission delay condition is a delay.

86. (Currently Amended) The method defined in Claim 33 wherein the first side is ~~the~~ a customer side and the second side is ~~the~~ a provider side.

87. (Currently Amended) The network device defined in Claim 39 wherein the first side is ~~the~~ a customer side and the second side is ~~the~~ a provider side.

88. (Currently Amended) The network device defined in Claim 71 wherein the first side is ~~the~~ a customer side and the second side is ~~the~~ a provider side.